

Sources of resistance to grapevine bacterial canker disease in *Vitis*¹⁾

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Gegen Reben-Bakterienbrand resistente Genotypen der Gattung *Vitis*

Zusammenfassung: 14 *Vitis* spp., 7 andere Vitaceen und 73 Sorten von *V. vinifera* bzw. *V. labrusca* wurden unter natürlichen und künstlichen Inokulationsbedingungen auf ihre Resistenz gegen Bakterienkrebs der Rebe (GVBCD) geprüft. Von den *Vitis*-Arten war *V. vinifera* hochanfällig, während die anderen Species resistent oder hochresistent waren. Die Vertreter der übrigen Vitaceengattungen waren alle hochresistent. Bei den geprüften *V. vinifera*-Sorten waren kernlose Typen anfälliger als kernhaltige. Unter den kernlosen Sorten waren wiederum die rotbeerigen anfälliger als die weißen Sorten.

Key words: bacteria, disease, grapevine bacterial canker disease, GVBCD, *Xanthomonas campestris* pv. *viticola*, Vitaceae, *Vitis*, variety of vine, screening, resistance, seed, pigments.

Introduction

Grapevine bacterial canker disease (GVBCD) caused by *Xanthomonas campestris* pv. *viticola* (NAYUDU) DYE has become a serious problem to tropical viticulture in India (CHAND and KISHUN 1990). The chemical control of disease is not encouraging (CHAND 1989). However, the disease can be managed well by late October pruning (CHAND *et al.* 1991), which, on the other hand, is not helpful to meet the various marketing demands and other needs of growers. Breeding of resistant grapevines would be an effective means of disease control. As information pertaining to the resistance of *Vitis* genotypes to GVBCD is insufficient, a number of *Vitis* species and cultivars were screened for their response to infection and results are reported.

Materials and methods

In the years 1988, 1989 and 1990, 14 *Vitis* spp., 7 other Vitaceae and 73 cultivars (Tables 1 and 2) were screened under field conditions in Maharashtra. Data on disease intensity were recorded during July to October (monsoon), using a 0 to 5 points rating scale (0 = no disease; 1 = 1—5 % of leaf area infected; 2 = 6—20 % infection; 3 = 21—50 % infection; 4 = 51—80 % infection; 5 = > 80 % infection).

Species and cultivars found resistant under field conditions were further tested by artificial inoculation using mechanical injuring of the leaves and spraying of inoculum (CHAND and KISHUN 1991). Throughout the experiment a single virulent isolate of *Xanthomonas campestris*, I1HXC (NCPPB 3611), was used.

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Vitis spp. and cultivars/hybrids were classified as highly resistant = no infection (HR), 'resistant' = < 5 % of leaf area infected (R), 'moderately resistant' = 6—20 % infection (MR), 'susceptible' = 21—50 % infection (S), 'highly susceptible' = > 50 % infection (HS).

Results and discussion

There was conspicuous difference in resistance within the genus *Vitis* (Table 1). *V. vinifera* was highly susceptible, while *V. labrusca* showed resistance under field conditions, but after artificial inoculation it turned into 'moderately resistant'. Species such as *V. cinerea*, *V. longii*, *V. riparia*, *V. palmata* and *V. parviflora* showed high-resistance reaction while the rest of the *Vitis* spp. was resistant. The other Vitaceae tested were highly resistant. Among *V. vinifera* cvs (Table 2), the seedless cultivars were relatively more susceptible as compared to the seeded ones. Coloured seedless cultivars were highly susceptible, followed by white seedless ones. The pattern of susceptibility

Table 1

Resistance of different *Vitis* spp. and other Vitaceae to grapevine bacterial canker disease
Resistenz von *Vitis* spp. und anderen Vitaceen gegen Reben-Bakterienbrand

| Vitis spp./other Vitaceae | Reaction |
|-----------------------------------|----------|
| <i>Vitis</i> spp. | |
| 1. <i>V. vinifera</i> L. | S to HS |
| 2. <i>V. labrusca</i> L. | R to MR |
| 3. <i>V. rotundifolia</i> MICHAUX | R |
| 4. <i>V. champini</i> PLANCHON | R |
| 5. <i>V. cordifolia</i> MICHAUX | R |
| 6. <i>V. aestivalis</i> MICHAUX | R |
| 7. <i>V. rupestris</i> SCHEELE | R |
| 8. <i>V. berlandieri</i> PLANCHON | R |
| 9. <i>V. candicans</i> ENGELMANN | R |
| 10. <i>V. cinerea</i> ENGELMANN | R |
| 11. <i>V. longii</i> PRINCE | HR |
| 12. <i>V. riparia</i> MICHAUX | HR |
| 13. <i>V. palmata</i> VAHL | HR |
| 14. <i>V. parviflora</i> ROXBURGH | HR |
| Other Vitaceae | |
| 15. <i>Ampelocissus</i> sp. | HR |
| 16. <i>Ampelopsis</i> sp. | HR |
| 17. <i>Cayratia</i> sp. | HR |
| 18. <i>Cissus</i> sp. | HR |
| 19. <i>Parthenocissus</i> sp. | HR |
| 20. <i>Tetrastigma</i> sp. | HR |
| 21. <i>Leea</i> sp. | HR |

HR = highly resistant, HS = highly susceptible, MR = medium resistant, R = resistant, S = susceptible.

Table 2

Resistance of different *Vitis vinifera* and *V. labrusca* varieties to grapevine bacterial canker disease
Resistenz von *Vitis-vinifera*- und *V.-labrusca*-Sorten gegen Reben-Bakterienbrand

| Varieties | Reaction | |
|---|-----------------------------------|--------------------------------------|
| | Natural conditions without injury | Artificial inoculation with injuring |
| <i>V. vinifera</i> | | |
| Black seedless | | |
| Beauty Seedless, Sharad Seedless, Flame Seedless, 29-3 (Black Champa × Thompson Seedless), 29-4 (Black Champa × Thompson Seedless), 30-16 (Black Champa × Thompson Seedless) | HS ⁺⁺ | HS ⁺⁺⁺ |
| White seedless | | |
| Arka Vati, Manik Chaman, Perlette, Pusa Seedless, Sonaka, Centennial Seedless, Tas-e-Ganesh, Thompson Seedless | HS ⁺ | HS ⁺⁺ |
| Coloured seeded | | |
| Almeria, Buckland Sweetwater, Shirai blanc, Black Champion rose, Black Prince, Cabernet noir, Cinsaut noir-3, Chirch noir, Cabinet Sang, Convent Large black, Charas, Chaouch, Dakh, Gulabi, Hamburg Queen, Kandhari, Kali Sahebi, Karge noir, Kishmish Chernyi, Muscat Hamburg, Pinot noir, Quimand, Jubilee, Red Muscat, Red Prince, Tar Sahebi black, Ugni blanc, 5-12 (Anab-e-Shahi × Black Champa), 6-2 (Anab-e-shahi × Black Champa), 21-28 (Bangalore blue × Convent Large black), 14-20 (Black Champa × Anab-e-Shahi) | S | HS ⁺ |
| White seeded | | |
| Angoor Kalan, Anab-e-Shahi, Arka Kanchan, Arka Hans, Bhokri, Castiza, Fakhri, Chardonnay, Merlot noir, Palomino, Pandhari Sahebi, Golden Queen, Rao Sahebi, Sapin Sahebi, Sahebi Ali, Tas, 5-4 (Anab-e-Shahi × Black Champa), 9-3 (Anab-e-Shahi × Queen of Vineyards), 7-12 (Anab-e-Shahi × Convent Large black), 4-30 (Anab-e-shahi × Black Champa) | MR | S |
| <i>V. labrusca</i> | | |
| Amber Queen, Athens, Bangalore blue, Concord, Isabella, Kishmish red, Convent Large white, Murza Izyum | R | MR |

R = ≤ 5 %, MR = 6—20 %, S = 21—50 %, HS⁺ = 55—65 %, HS⁺⁺ = 65—75 %, HS⁺⁺⁺ = > 80 % of leaf area infected.

in seeded, coloured and white cultivars was similar as recorded for the seedless cultivars. There was no difference in resistance among the cultivars of *V. labrusca*.

The exact mechanism of susceptibility with seedless cultivars is not known but it can be hypothesized that resistance traits are linked with seedness. However, resistance traits for seedless and pigmented are cultivar independent.

The screening of germplasm for resistance against GVBCD revealed resistance sources among *Vitis* spp. some of which could be used to improve resistance of *V. vinifera* by crossbreeding. This is possible since all grape species within the genus *Vitis* are intercrossable and produce vigorous and fertile hybrids (OLMO 1979). Moreover, most of the *Vitis* spp. found resistant against GVBCD were also reported resistant against other important diseases such as downy mildew, anthracnose and powdery mildew (PATIL *et al.* 1990).

Summary

14 *Vitis* spp., 7 other Vitaceae and 73 cultivars belonging to *Vitis vinifera* and *V. labrusca* were screened under natural and artificial inoculation conditions for their resistance to grapevine bacterial canker disease (GVBCD). Among the *Vitis* species, *V. vinifera* was highly susceptible, while others were either resistant or highly resistant. Vitaceae other than *Vitis* were highly resistant. Among the *V. vinifera* cultivars, seedless ones were more susceptible than seeded vines. Among seedless cultivars, coloured were more susceptible as compared to white ones.

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